concrete construction

JANUARY 1958 **VOL. 3, NO. 1**

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Many readers have requested additional information concerning this still-relatively-new family of concrete adhesives. This objective article is a follow-up on a brief discussion we published some months ago.

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CONCRETE CONSTRUCTION MAGAZINE
139 No. Clark St., Chicago 2, Illinois ANdover 3-4329

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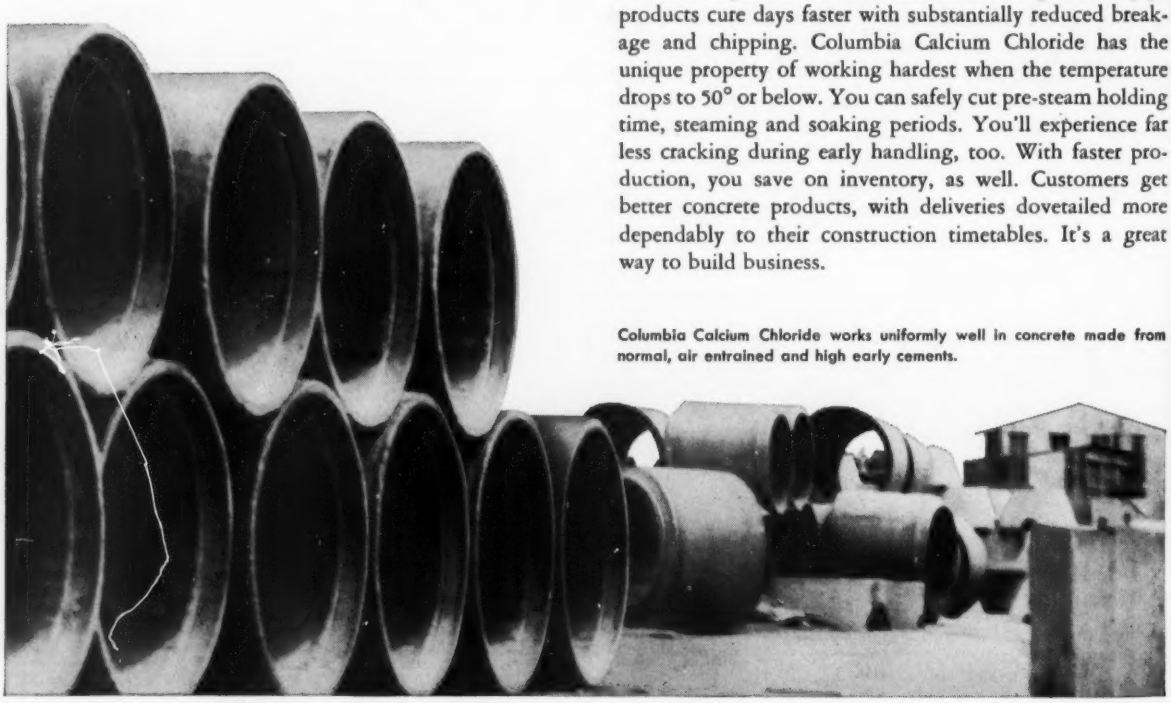

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Photo courtesy of Bay State Products Co.

SAWED JOINTS

Tried and proven,

this labor- and time-saving method

is fast becoming standard practice.

WITH HOURLY WAGES continuing to mount higher and higher, new means of conserving labor and time are being sought continually. Some of the answers to this pressing need—mechanization, automation, production lines—are common sights today on the American scene.

Labor-saving techniques have been adapted to paving, too, in an effort to keep pace with the tremendous increase in population and automobiles and at the same time control spiraling costs. Today paving trains lay ribbons of concrete at a pace undreamed of less than a generation ago.

To achieve this speed it was urgently necessary to devise some substitute for formed joints that would give equal or better results without necessitating large work crews.

The best answer so far devised is the sawed joint which provides a weakened

Photo courtesy of Concut Sales, Inc.

ABOVE: Successful result of sawing is shown in this photograph—a single, clean crack through the slab at the joint.

LEFT: The best way to determine the correct time to saw is by trial and error. Make a short cut; if slight raveling such as this is present at the joint, it is the proper time to saw. If blade wear is great, postpone sawing a while.

plane as a means of controlling the location of contraction cracks. It also creates a recess for the application of sealing material to prevent water and foreign materials from invading the joint and the subgrade. The first known use of sawed joints was in Kansas in 1949, but so rapidly has the technique taken hold that today it is being used in most of the 48 states, as well as in many foreign countries.

WHEN TO SAW

To the man on the street, concrete exists in only two conditions—green and hardened. In a sense this is true, but such a concept tends to cloud an important aspect of the curing process. When concrete has hardened, it has only just begun a period of strength gaining that is to last not hours or days but years. Naturally, the gain is greatest in the early days; and, as far as cracking is concerned, the most crucial period may be reduced to the first several hours after hardening.

It follows that joints must be sawed during the first several hours after pouring before tensile stresses build up to a point sufficient to cause cracking. On the other hand, premature sawing causes excessive spalling, water erosion and blade wear on diamond blades. No time schedule can be set up for sawing since weather conditions vary too much. The proper time has varied from as few as 4 to as many as 12 hours after pouring.

Experience in several states indicates that slabs poured during the first half of the day crack a day sooner than those poured during the last half. Morning concrete, which cracks the first night, should, therefore, be sawed the same afternoon or evening unless weather conditions retard the set greatly.

In any case, the best way to determine the proper time for sawing seems to be to make a short cut. It is the proper time for sawing if a slight raveling is apparent at the cut. If the concrete is damaged, sawing must be postponed.

Trouble with random cracking is sometimes encountered if relief joints are not formed or sawed at an early age. These are placed at intervals of from 60 to 100 feet. Then the intervening contraction joints can be sawed at any time up to 30 days.

Diamond blades wear rapidly when sawing is done early because abrasion from loose sand particles is greatly in-

The operation shown in the above photograph follows soon after the sawing of the joint. The kerf should be thoroughly cleaned and any loose gravel or other debris washed out before it hardens in the joint and clogs the opening. Now the joint is ready for sealing.

A special pressure-sealing machine is used in the final step of filling the joint about ¼-inch below the surface of the slab. Underfilling the joint prevents the extrusion of the sealing material. No annoying ridges are present to mar the smooth riding qualities of the pavement.

creased. It is a good general rule when using silicon carbon blades to saw as early as is possible without damage to the concrete; when using diamond blades saw as late as possible before cracking occurs. Some contractors use silicon carbon blades for relief joints and saw contraction joints with diamond blades.

Sawing does not change requirements regarding transverse joint spacing. Minimums of 15 or 20 feet are still applicable if no distributed reinforcement is used, while spacing up to 100 feet is allowed with steel.

HOW DEEP AND WIDE?

Essentially, the depth of joints needed for crack control is the same whether they are sawed or formed. There is, however, one factor that makes a big difference. The cost of formed joints is not much affected by their depth. Generous safety factors have accordingly been provided in specs when it comes to contraction joint depth.

Sawed joint costs, on the other hand, are greatly influenced by the depth of the cut. A 2-inch cut costs more than twice as much as a 1-inch cut. The minimum depth for sawed joints is 1-inch. Climate and aggregate size seem to be factors in determining the cut depth, but a 1½-inch cut has been found successful in all states. Some designers use the rule of thumb that the depth of cut in both longitudinal and transverse joints should be 1/6th of the pavement thickness, or as deep as the diameter of the maximum size aggregate used.

Cut widths varies according to the type of blade used. Diamond blades produce a ⅛-inch joint and silicon carbide discs result in ¼-inch cuts. If a wider joint is desired, a second shallower cut may be sawed next to the original cut and the intervening concrete chipped out.

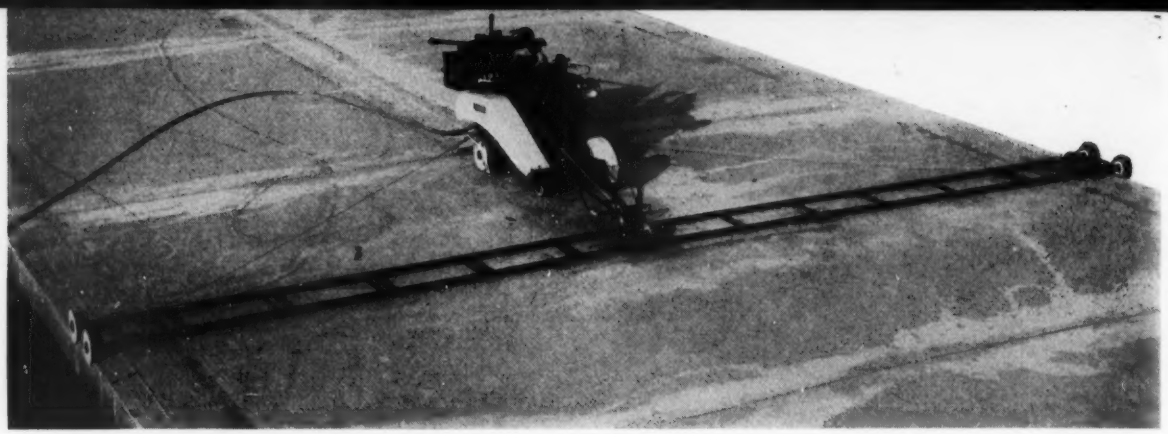
SEALING

Among the prime advantages of sawed joints are their smooth and quiet riding characteristics. This is the result of their narrow width and the elimination of overfinishing, spalling and sealing compound ridges.

To assure the last mentioned advantage, sawed joints must be sealed carefully. Special pressure-sealing machines fitted with narrow nozzles should be used. Underfill joints about ¼ inch to prevent extrusion of the compound.

Sealing materials are put to an extreme test when used in sawed joints. It has been determined that ⅛-inch joints in 50-foot slabs open to ⅜ inch at freezing temperatures. This calls for a 200 percent stretch in the sealing compound — considerably more than the 50 percent stretch commonly specified for such materials. The seriousness of the imperfect seal against moisture and foreign materials depends upon local conditions. Some states are presently experimenting with unsealed sawed joints.

There is evidence that curing method may be of somewhat greater importance in connection with sawed joints, but this general subject hasn't been thoroughly explored to date. More information seems to be needed on the relationship between curing and the development of shrinkage stresses. Water retention seems to be an important consideration in sawed-joint construction, and the method of curing should be selected with this in mind. Curing sawed joints with waterproof paper, wet burlap and similar materials seems to give entirely satisfactory results. Curing can be begun earlier, since there is no need to wait for the finishers to complete the joints. When



ABOVE: The longitudinal guide eliminates the need for all marking operations and also eliminates wavers in the sawed joint which develop if the machine is not mechanically "locked" into its line of travel.

BELOW: This type of saw proves economical on small- and medium-sized jobs. Transverse and longitudinal joints can be sawed at the same time or sawing of the longitudinal joints can be postponed up to 30 days.

membrane curing is employed it is believed that special precautions should be taken to cure the faces of the saw cuts. When cold-applied joint seals are used, these materials can be applied immediately after the sawing operation, and they will serve as a medium for curing the joints.

EQUIPMENT

The first concrete saws were manually-propelled machines with a single blade driven by 7- to 13-hp. gasoline engines. At present the most popular saws are the 30-hp. self-propelled hand machines or multi-bladed joint saws. The latter are machines that employ two or more blades in line for more rapid cutting; they may ride directly on the pavement or they may run on the side forms.

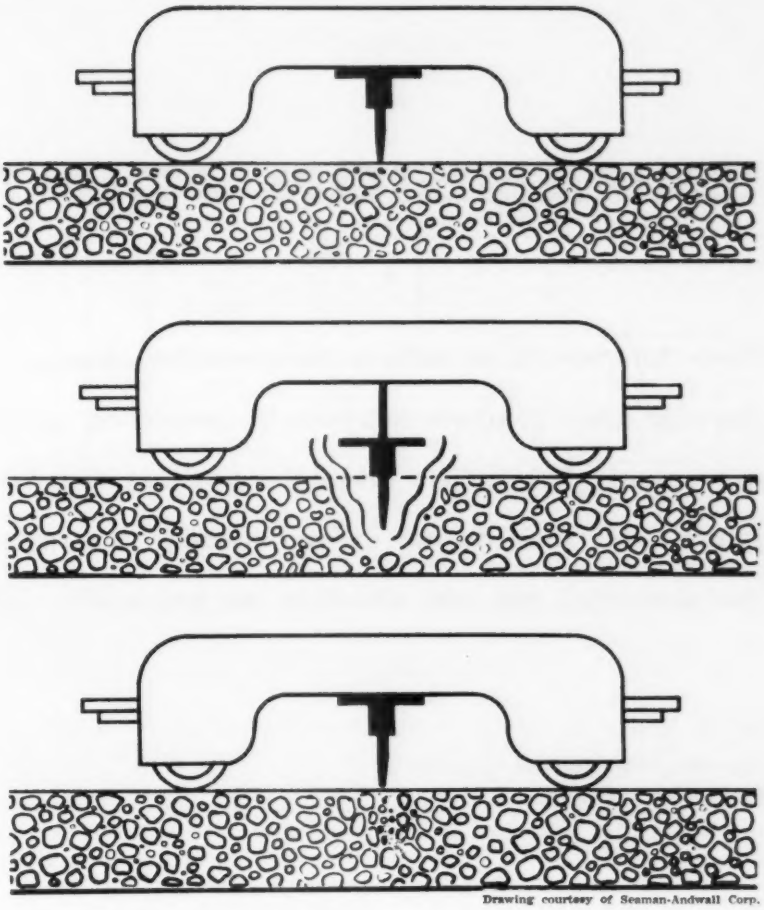
The multi-bladed machines are equipped with a hydraulic drive for moving from joint to joint. The saw carriage is raised and lowered hydraulically and has a hydraulic torque converter crossfeed. This type of saw saves many man hours by eliminating the need for marking transverse joints; by eliminating the need to turn the saw around on the initial lane of 12-foot or 24- to 25-foot pavements; by moving faster from joint to joint; and by increasing the cutting speed through the use of 2 or 4 blades instead of just one. It has been estimated that a joint saw will do the work of 5 self-propelled hand machines.

Formerly longitudinal joint marking required considerable time to measure and snap the necessary lines. Now the use of a longitudinal joint guide eliminates the need for all marking operations, since this device mechanically locks a 30-hp. self-propelled hand saw into its line of travel. It has been estimated that approximately 20 to 25 percent of the saw operator's work day was formerly consumed in measuring and marking.

Large quantities of water are required for successful sawing of pavement joints. Water has an important effect on costs since it prolongs blade life by cooling and lubricating. It also serves to flush away from the saw kerf, and the adjacent concrete, the slurry of water and fine particles of concrete produced in sawing.

Mention should be made of a fairly new development which is said to combine the best features of ordinary sawed and hand-formed joints. This is a vibrating joint cutter which follows immediately behind the longitudinal finishing machine, lowering a T-shaped cutter bar into the fresh concrete at each joint location. Mechanical vibration of the bar causes the aggregates to separate during the lowering operation, but it pulls sand and cement mortar back into the joint as the bar is withdrawn.

After the joint is smoothed with hand floats there is no evidence of what has been done, but the coarse aggregates remain parted. When the joint is sawed a few hours later, a shallow cut only 1 inch deep is sufficient to create the desired plane of weakness, and since there is no coarse aggregate in the path of the blade, blade life is longer and cutting speeds are considerably greater. Some reports indicate that this technique may result in savings of as much as 70 or 80 percent over conventional sawing



Drawing shows the cutter bar of the vibrating joint cutter as it begins its travel into the slab. It is lowered by hydraulics. Vibration action begins.

Cutter bar at the bottom of the joint. Aggregate positioning has now been changed so that only sand and cement will be in the joint area.

Cutter bar is raised from the cut, the depression or crevice formed fills with sand and cement mortar. Surface may now be easily finished over with floats and straight edges leaving no evidence of the cutter's use.

Drawing courtesy of Seaman-Andwall Corp.

methods. There is also a secondary savings factor due to a substantial reduction in the amount of joint filler material required.

The cost of sawed joints appears to vary over a rather wide range as a result of such variable factors as aggregate hardness, strength of concrete at the time of sawing, depth of cut, blade type, equipment design, and the experience of operators. As reported by various agencies, costs may range from a low of 3 cents per linear foot of joint to a high of 83 cents, with the average amounting to around 35 cents per foot.

The largest item of expense in all cases seems to be the cost of blades. Diamond blades, for example, may cost around $150 each. Since the life of such a blade may vary from less than 400 to as much as 5000 linear feet of joint, this factor is mainly responsible for the wide range of over-all costs.

Fairly accurate cost figures kept on two pavement projects in Illinois* indicate that the physical characteristics of the coarse aggregate may be the pivotal factor in the cost of sawed joints. Although both aggregates were gravels, one was essentially a limestone gravel and the other was a mixture of limestone and hard siliceous and igneous materials.

Blade life for the limestone gravel averaged 1600 linear feet of joint 2¾ inches deep; for the harder gravel blades averaged only 700 feet of joint. Total cost of sawing on these two projects amounted to 34 cents per foot of joint for the limestone aggregate, as compared with 47 cents per foot for the harder material.

On projects in the state of Kansas sawing costs with diamond blades have averaged 10 cents per foot where the mix has consisted of crushed limestone and sand, 27 cents per foot for sand-and-gravel mixes, and 40 cents per foot for mixes containing chat.

CONCLUSIONS

On the basis of all the evidence now available, sawed joints are as effective as formed joints in controlling cracking. In addition they bring about a noticeable improvement in the riding qualities of pavements, and they appear to assure better performance of the concrete at the joints. And finally, most contractors who have had enough experience to form the basis for judgment seem to agree that the sawed joint has a favorable effect on over-all paving efficiency.

From an economic view it is reassuring to know that costs are to at least some extent within the control of the contractor. He can hold costs within reasonable limits by sawing only to a depth sufficient to assure separation of the slab when it shrinks, and specifications should require no more than this; he can time the sawing operation to assure minimum blade wear and maximum cutting speed; and he can train personnel to handle equipment in such a way as to encourage maximum blade life.

One thing seems to be certain at this point; the sawed joint has won an important place for itself in the paving picture, and it's plainly here to stay. END

*Reported by John E. Burke of the Illinois Division of Highways at the 40th annual Convention of the National Ready Mixed Concrete Association.

EXPANSION JOINTS

Their function is to relieve compressive stresses that develop when concrete expands by providing space for movement. This article takes the position that sawed joints, since they do not extend through the depth of the concrete, are not effective as expansion joints.

By T. R. Johnson

Chairman, Public Relations Committee
Expansion Joint Institute

EDITOR'S NOTE

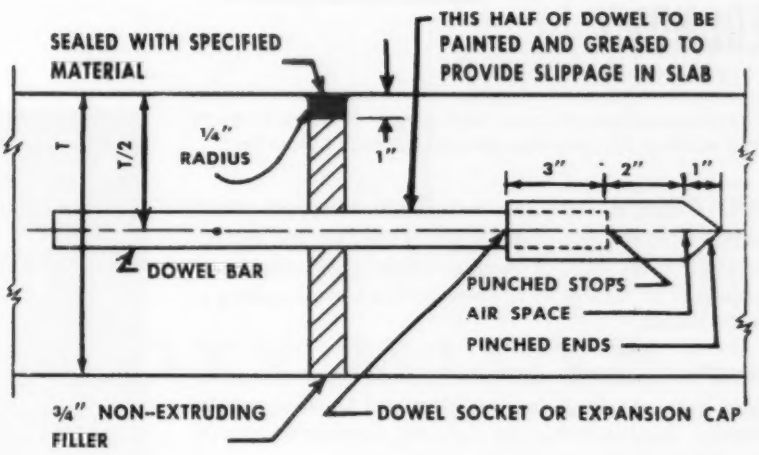
The article which begins on page 3 of this issue focusses attention on sawed joints and does, we believe, a pretty good job of presenting their major advantages. Since there are some areas of disagreement on the subject, especially in respect to the omission of expansion joints, we invited Mr. T. R. Johnson of the Expansion Joint Institute to state the case from the standpoint of those who believe that both types of joints are essential. For readers who wish to pursue the subject further, the Expansion Joint Institute, formed recently by the major manufacturers of premoulded joint materials, has just published a comprehensive manual entitled "Design Practices and Uses of Premoulded Joints in Concrete Pavements." The manual may be obtained, free of charge, by writing to the Expansion Joint Institute, 121 Hill Avenue, Aurora, Illinois, or by filling out one of the postage-paid reader service cards in this issue.

FILE JOINTS

ALTHOUGH THE SUBJECT of joints in the construction of concrete highways has been considered controversial by many, there are really only a few important areas of disagreement among those who understand the basic engineering principles involved. For example, recently there has been a trend toward eliminating expansion joints and instead using narrow sawed joints. The reference to sawed joints is actually a misnomer. In the writer's opinion there is no such thing as a sawed joint. Concrete slabs are sawed to create planes of weakness so that controlled cracking will take place with contraction. It is presumed that such joints eliminate restraint and uncontrolled contraction cracks.

Anyone familiar with the coefficient of expansion of concrete realizes the necessity of providing adequate expansion joints; also the necessity to eliminate intermediate cracks by creating planes of weakness to predetermine the location of contraction cracks. In their zeal to lower the cost of concrete highway construction, some engineers have been using only sawed joints, completely disregarding the important function of properly spaced through expansion joints. We must remember that although a sawed "plane-of-weakness" joint does serve a valuable purpose, it should only be used between properly spaced through expansion joints . . . and not as a substitute for the necessary expansion joints. As in every engineering project, the economy of construction of a pavement should be judged not by its initial cost but by the total of the annual costs incurred over its service life. Although expansion joints will add slightly to initial cost at the time of construction, they provide a substantial reduction in maintenance costs over the years. A reduction in annual maintenance costs means that public expenditure can be reduced, or additional mileage of pavement provided, for the same expenditure of funds. The promiscuous elimination of expansion joints in modern-day highway construction has added appreciably to maintenance costs.

After proper provision of the necessary expansion joints, contraction joints should be used to relieve tensile stress caused by a decrease in volume of the concrete, and in some cases to control "warping stresses" associated with a temperature differential between the top and bottom of the slab. The most commonly used type of contraction joint is the dummy groove, or weakened plane joint, which may be formed through various methods. A contraction joint, in order to function properly, must be in straight and true alignment. After all, it is inserted to create a plane of weakness; hence what we really have in a so-called dummy joint is an unknown factor of slab fracture. A known factor of slab fracture can only be accomplished by in-



A premolded expansion joint filler is used in the type of doweled expansion joint pictured here. The function of the dowels is to assist in transferring loads.

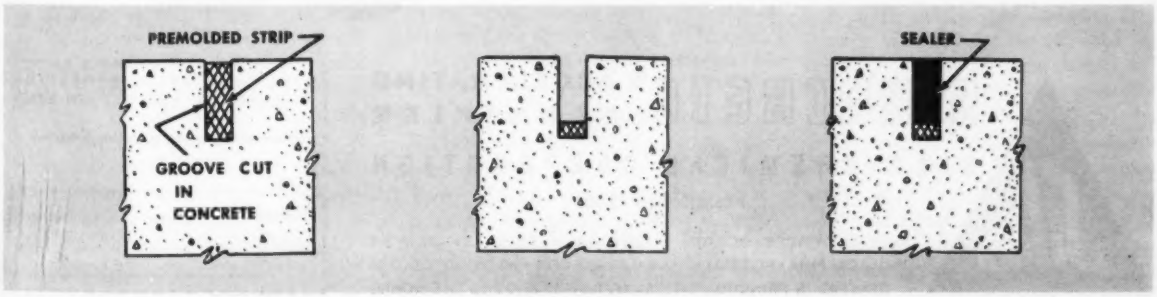
stalling a through contraction joint; that is a joint that runs from the top to the bottom of the concrete slab; or a trapezoidal design, such as the commonly used tongue and groove joints. The trapezoidal design has long proven its efficiency in use as center longitudinal joints. There is evidence in a good many of our older highways that sawed longitudinal joints tend to encourage spalling.

Sawed plane-of-weakness joints have some shortcomings. They are often not wide enough to receive an adequate supply of joint filler. Preliminary cracking before sawing, due to improper timing or curing of the concrete, will always be a problem. The sawing operation itself often creates many and serious restraint cracks in the concrete slab.

In order to function properly, contraction joints must be in straight alignment. This can best be accomplished by the installation of a premoulded joint into the freshly laid concrete. When the job is to be finished with a rubber-asphalt joint seal, the premoulded joint can be easily and economically sawed without using expensive diamond blades in the cutter, and the resulting crack is of the proper width to receive an adequate supply of joint filler. Another important factor in this type of operation is that the premoulded joint can be sawed out at any time after the concrete is hardened that is convenient for the contractor. This, of course, eliminates the timing hazard and provides an important cost saving factor as labor will not have to be kept overtime, as so often happens, to wait for what is hoped to be an ideal time to saw the hardening concrete. Sawed joints must be carefully sealed. It is desirable to underfill the joints about ¼ inch which prevents extrusion of the sealing compound.

It is the writer's opinion that engineers should carefully re-evaluate their design practices. There is a chance that we are moving backward in the manner in which we are constructing today's highways. There are important overall advantages to be gained through the construction of highways that are properly jointed. We are being "penny-wise and pound foolish" when we look only at initial costs. We have an obligation to build highways that will provide the most economical service lifetime. END

The drawings below illustrate one method of providing a dummy contraction joint for the elimination of intermediate cracks in concrete pavements. This method eliminates the hazards of directly sawing the hardening concrete. The figure on the left shows the dummy grove formed with premoulded strip; the center view shows the groove after the strip is sawed away; the right shows the joint filled with sealer.



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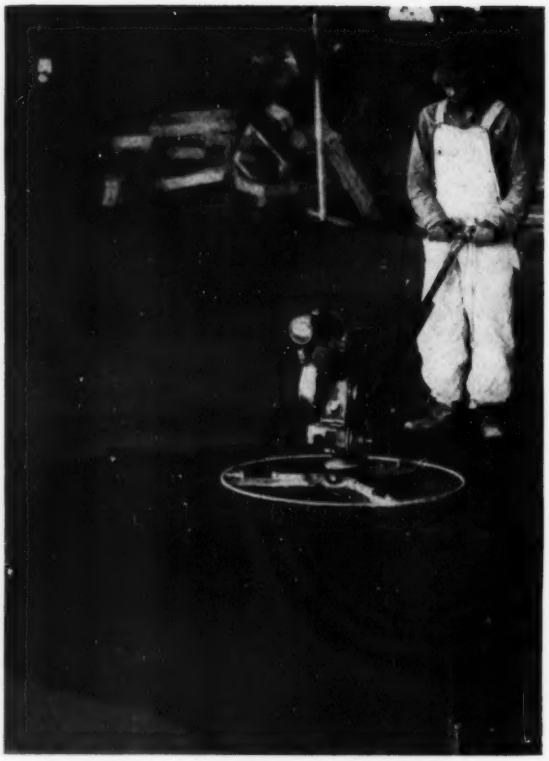

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A new look* at a family of materials which has almost breath-taking possibilities in the concrete construction field

EPOXY ALLOYS

By Gene M. Le Fave, *Chief Chemist*
Coast Pro-Seal and Manufacturing Co.

THE PROBLEM OF REPAIRING spalled and cracked areas in concrete structures has existed since the advent of cementitious materials. The notable lack of success associated with bonding new concrete to old by simple means is familiar to all who have worked with concrete materials. Many products have appeared on the market from time to time and proved effective in varying degrees. None, however, could ever be considered to bring about restoration of concrete—at least as permanent as the original.

Now such engineering materials are available, and the fact is buttressed by a large amount of realistic test data. All of these products are based on a relatively new liquid resin—called Epoxy—which, upon the addition of a hardener, sets up at normal temperatures to a remarkably tough plastic. The addition of another resin results in an alloy—a plastic alloy with a resultant improvement fully as surprising as its metallic counterparts such as iron-steel or copper-brass. Other "alloying" ingredients are being tested as partial replacements in order to effect cost reductions as well as even greater improvements in functional properties.

*For an earlier look, see "At Last Concrete Adhesives that are Stronger Than Concrete", CONCRETE CONSTRUCTION, March 1957, page 2.

Of the few such products available commercially, virtually all consist of Thiokol or Polyamide as the alloying ingredients; consequently the discussion shall be restricted to these combinations. The tenacious adhesive power of the Epoxy Alloys to virtually any clean surface may be attributed to their outstanding wetting properties and to their affinity for such surfaces. Both of these properties are retained after hardening.

A catalyst or hardener is used in the Epoxy Alloys which chemically causes the liquid alloy to set up to a hard, tough solid. The function of the hardener may be compared somewhat to that of calcium chloride in concrete mixes, where the effect is to increase the initial set and ultimate cure time of concrete.

As a matter of fact, there are a remarkable number of similarities between Epoxy Alloys and concrete as well as some sharp lines of difference. Table I compares the two materials.

COST CONSIDERED

Cost is, and will continue to be, the principal factor limiting the use of Epoxy Alloys. However, the initial price of the product must be viewed from the standpoint of labor, time and maintenance costs, inconvenience and annoyance associated with other methods of repair and the results obtained. The low density (1.1—1.3) or relatively high volume per pound frequently makes these alloys competitive with conventional products. For example, where the Epoxy Alloy serves as a binder for sand (as is the case in most void filling applications), the cost is more attractive.

NOT QUITE MIRACULOUS

Because these alloys perform some rather amazing feats there will be the usual tendency to stretch them by using more fillers, such as sand; but this will occasion the same unhappy results that occur when cement is extended excessively; the bond strength will be reduced as well as other physical characteristics, such as compressive strength and modulus. Satisfactory results will not be obtained without careful cleaning and surface preparation. Even though elasticity far exceeds that of concrete, the Epoxy-based Alloys will not replace an elastic joint requiring high elongation, such as a compression or expansion joint. Excessive heat and flame will destroy these materials in a very short time.

It seems that improvements will be developed at a rate that will make kitchen experiments pointless. (MORE)

The area to be repaired has been primed with a low-viscosity material containing 75 to 90 percent Epoxy Alloy, the remainder consisting of a volatile solvent. This material may be either sprayed or brushed. In the picture ordinary concrete is being placed over the Epoxy Alloy to complete the repair job.

BE WARY

Because of claims made by manufacturers without a successful history and reputation in the plastics field, it is particularly important to the user that his materials come from a reliable, responsible source; that they be properly designed and quality controlled, and backed up with competent service.

The superficial ease of making the Epoxy-Alloy may be expected to induce fringe manufacturers to enter this potentially large-volume field. It is, therefore, of paramount importance that the buyer request proof of performance, consult independent test laboratories, set up specifications, and do whatever else seems necessary to establish confidence in the vendor.

FOR THE FUTURE

Like aluminum, steel and concrete, the Epoxy Alloys are engineering materials and their effective use requires experience to develop a "feel" for proper handling. Confidence based on experience will inevitably lead to applications now unknown or unexplored. It may be expected that the greatest contributions will come from the construction industry itself.

The manufacturers of the Epoxy Alloys will continue to improve the products, while the user will make sug-

TABLE I

Comparison of Concrete and Epoxy Alloys

CONCRETE	EPOXY ALLOYS
Completely stable under heat and relatively flame stable.	Degrades under excessive heat and/or flame. Properties poor above 225°F.
Attacked by both acids and alkalis, solvent resistant.	Inert to everything but very strong acids and a few solvents at elevated temperatures.
Bond to metals inconsistent; poor bond to cured old concrete.	Adheres to masonry materials, glass, metals and most plastics.
Requires at least seven days' cure with normal concrete before use.	At most, 24 hours before use with rare exceptions.
Low initial cost. Primary construction material.	Relatively high initial cost. Repair and restoration material.
Narrow range of working characteristics.	Working characteristics can be varied over wide range; i.e., brush, spray, trowel or pneumatically applied.
Cure can be accelerated by heat but requires moisture.	Cure accelerated by heat alone.
Degrades after excessive freeze-thaw cycle.	Unaffected by freeze-thaw cycle.
Not sound and bounce absorbent.	Relatively sound and bounce absorbent.
Frequently dusts under abrasive load.	Non-dusting.
Often porous and retains moisture.	Water absorption very low.

gestions toward eliminating the "bugs" which are so difficult to anticipate. Much effort will be directed toward reducing costs. Groundwork is now being laid for equal part and single part alloys; that is, liquid resins which, when mixed in a 1:1 ratio, harden as usual. Even more convenient is the single component package.

Since the properties of Epoxy Alloys exceed those of concrete in most important aspects (see Table II) it becomes apparent that in their application the concrete will generally constitute the weaker link.

APPLICATIONS

The uses of Epoxy Alloys already cover a large area, and the number is increasing rapidly. They are being used with good success in the repair and restoration of all types of building, highways and roads, walks, underpasses and bridges, basements, swimming pools, irrigation and sewer systems, dams, silos and grain elevators. In these applications they are bonded to concrete, brick, tile, glass, plaster, stucco, wood and stone, as well as to some asphalts and plastics, and their function is to correct such faults as spalls, honeycombs, cracks, cleavages, porosity and roughness.

This remarkable family of materials is also being used for cladding and coating industrial and commercial flooring and terrazzo, for waterproofing and decorative surfacing, for making anti-skid pavements and traffic lines, and for waterproofing. It is also used for a wide variety of bonding jobs, such as grouting bolts and reinforcing rods, tile setting, underlayment, attaching facing materials to walls, anchoring traffic bars to slabs and attaching precast sections to other portions of structures.

HOW TO APPLY

In general, Epoxy Alloys are available in three grades:

1. A relatively mobile self-leveling syrup with good penetrating properties for filling horizontal cracks and coating purposes.
2. A thinned version of (1) with a low viscosity containing 75 to 90 percent alloy and the remainder volatile solvent for priming purposes. It may be easily sprayed or brushed.
3. A viscous, non-sagging material for overhead and vertical filling purposes.

The first material may be adjusted to the application by the user in order to attain certain desired properties. This adjustment may be accomplished by the addition of sand, flint shot, stone or lightweight aggregates, dry cement, masonry dust and similar fillers. Even colored pigments may be used effectively. It is strongly recommended, however, that the manufacturer be asked about approximate proportions, mixing procedures, most reliable sources, and the type of fillers to avoid.

Preparation for the application of Epoxy Alloys is not involved, but certain procedures must be adhered to if acceptable results are to be obtained. Surfaces must be free of oil, grease, dirt and loose particles or the weld-type bond obtainable with the Epoxy Alloys will not be satisfactory. This cleaning is best done mechanically by sand blasting, wirebrushing or grinding with an appropriate tool. Oil and grease are removed with a strongly alkaline detergent, while organic coatings may usually be removed with conventional paint strippers.

Air lines used to remove loose particles must for obvious reasons have an efficient oil filter. It is extremely important that there be no moisture on surfaces to which the Epoxy Alloys are expected to bond. Heating such surfaces sufficiently will insure dryness as well as thorough and speedy hardening of the alloys, since below 50 degrees F. they set up at an impractically slow rate. Tools and mixing equipment must be cleaned with acetone or diacetone alcohol prior to hardening or they will be nearly impossible to clean. The rate of hardening is dependent upon ambient temperatures, amount and kind of filler, as well as type and quantity of hardener supplied by the manufacturer. Thus anywhere from four to twenty-four hours are required to harden the Epoxy Alloys sufficiently for use.

As in all concrete repair work, preparation of the original material is the key to successful Epoxy Alloy repairs.

It might be mentioned here that the mixing instructions should be followed both for optimum results and to place responsibility on the manufacturer for a quality result. Infrequently certain individuals are sensitive to these compounds and develop a mild dermatitis. This can usually be avoided by removing the material with acetone and washing with warm water and soap. As with cementitious products, excessive contact is undesirable. (MORE)

TABLE II

Physical Properties of Epoxy Alloys

Compressive Strength	20,000 to 45,000 psi
Tensile Strength	7,000 - 11,000 psi
Impact Resistance	Excellent
Barcol Hardness	25 to 50 Barcol
Elongation (elasticity)	25 - 75 times that of concrete
Water Absorption	0.1 to 0.2%
Abrasion Resistance	Excellent
Corrosion Resistance and Weathering	Excellent

ABOVE: Pavement notch spalls being repaired with a mortar consisting of medium-viscosity Epoxy Alloy and sand.

Hairline cracks are filled and sealed with the medium viscosity Epoxy Alloy by applying with a stiff brush, trowel or knife, avoiding pinholes and air bubbles. Use a second coat, applied in the opposite direction, if necessary. Surface bubbles can be eliminated by lightly brushing acetone over the surface. Overhead areas are best covered by using the non-sagging type of Epoxy Alloy.

Large cracks are effectively filled with a mortar consisting of medium viscosity Epoxy Alloy and sand, or comparable filler, using standard knifing techniques. Overhead cracks, and sometimes cracks in vertical surfaces, require the non-sagging material. Where Epoxy Alloy mortars are used, priming with the thinned alloy is desirable to develop a 100 percent bonded "weld" joint.

Deep fissures and cleavages, if properly repaired, aptly demonstrate the almost phenomenal properties of the Epoxy Alloys. The mortar is first knifed in as deeply as practicable, allowed to harden, and then drilled to receive a caulking gun tip. A moderate viscosity alloy material, obtainable in throw-away tubes, is pumped into the holes until the cleavage is completely filled. When the material hardens, it provides a bonded joint considerably stronger that the masonry itself.

Spalls may be repaired with either an Epoxy Alloy mortar or the non-sagging material, depending on the location and geometry of the areas to be repaired. After filling, screeding and trowelling to a featheredge will produce an attractive and permanent restoration. Where economy is important, such as in excessively deep spalls, a layer of Epoxy Alloy is applied, allowed to partially harden, and sharp stone aggregate is then imbedded in the surface, protruding sufficiently to provide an anchor for a standard cement-based mortar.

These suggestions for using the Epoxy Alloys are representative and are intended only as a reasonable point of departure for developing improved techniques and a guide for those considering their use. As mentioned earlier, there is a bright future for this new engineering material, and it is hoped these comments will contribute toward a better understanding of its properties, applications and use.

END

BELOW: Spraying an Epoxy Alloy pavement patch with a membrane curing compound. Anywhere from 4 to 24 hours are required to harden this material sufficiently for use. The hardening rate depends on such factors as ambient temperatures and the types and amounts of filler and hardener used.

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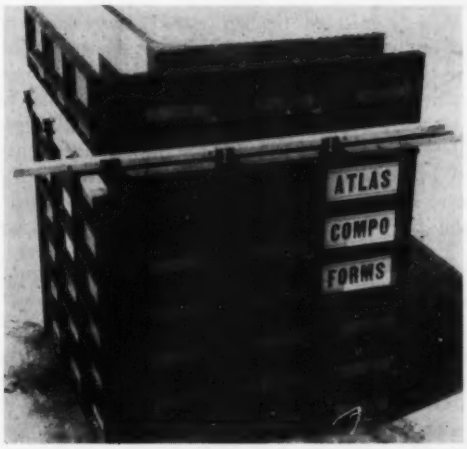

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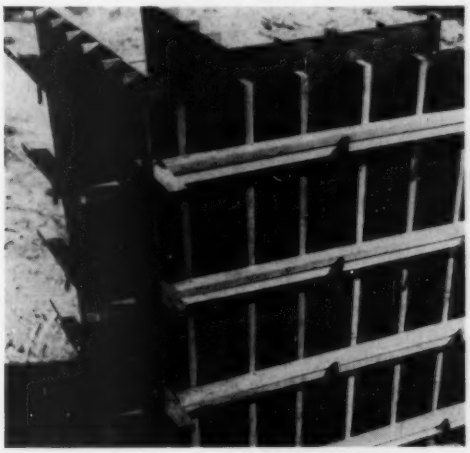

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joint material makers form national institute

A recent development of interest to the concrete construction industry is the formation of the Expansion Joint Institute, composed of representatives of the following organizations: The Celotex Corporation, W. R. Meadows, Inc., Presstite-Keystone Engineering Products Company, and Servicised Products Corporation.

The Institute plans to conduct research in the manufacture, uses and applications of premoulded joint materials, to collect, publish and disseminate statistics and information of interest to the members, the building industry and the public; to promote fair and equitable practices calculated to serve the best interests of those engaged in the premoulded joint industry and the public who buy and use the products of the industry; and to cooperate in the adoption and maintenance of uniform and high specification standards in the manufacture of premoulded joint materials.

One of the first projects of the new organization has been the production of a technical manual, the first of its type, explaining joints and their applications. The new manual is entitled, "Design Practices and Uses of Premoulded Joints In Concrete Pavements."

A free copy of the manual can be obtained by writing to the Expansion Joint Institute, 121 Hill Avenue, Aurora, Illinois, or by filling out and mailing one of the postage paid reader service cards in this magazine.

study puts business failures in perspective

Business failures, although rising in 1956 and in 1957, have not kept pace with the upsurge in the total business population. During the first six months of 1957, 9,946 out of every 10,000 business concerns in the United States did *not* fail with losses to creditors, according to a recent study of the Business Economics Division of Dun & Bradstreet, Inc. This study, which has just been published by the credit reporting agency, covers business failures and resultant creditors' losses from 1920 through the first six months of 1957. To round out the failure picture over this period, failures and creditors' losses are also analyzed by location, by industry, by age, by size, and by cause.

More than half of the failures occur in businesses that have been in existence for five years or less. It is interesting to note that the proportion of "younger" failures has been declining steadily in the past 10 years with the exception of 1956 (from 77.6 percent in 1947 down to 56.6 percent in 1955 and up to 58.6 percent in 1956). However, the toll among businesses aged ten years or more has increased almost steadily in the same period (from 9.1 percent in 1947 to 18.3 percent in 1956). This would indicate that experience may not necessarily come with age.

Dun & Bradstreet also computes the failure rate for certain manufacturing lines. In 1956, the highest failure rate per 10,000 operating manufacturing concerns was 232 for furniture manufacturers. Leather and shoe manufacturers and apparel manufacturers were runners-up with failure rates of 175 and 144 respectively.

For the first half of this year, Dun & Bradstreet reports 7,089 business failures with creditors' losses of $336,408,000. Percentagewise, this represented an increase of 9 percent in numbers and 20 percent in liabilities as compared to a similar period of 1956. This upward trend appears to have slackened from the rise occurring between 1955 and 1956 when 16 percent more concerns failed and their liabilities mounted 25 percent.

Failure statistics compiled by Dun & Bradstreet do not include all discontinuances of business. Reported figures include only those concerns which go out of business with a loss to creditors. These include concerns filing petitions in bankruptcy, those who assign for the benefit of creditors, and those who do not resort to any recorded form of settlement.

Photo courtesy Worthington Corp.

costliest mile of highway on earth

Shown here are ready-mixed concrete trucks of the Whittemore Company of Boston delivering part of some 120,000 cubic yards of concrete for what is said will be the most expensive mile of highway ever built. The site pictured is close to Griffin's Wharf, from which a band of earlier Bostonians embarked for the ship-looting caper that history records as the Boston Tea Party. Scheduled for completion in April 1958, this mile-long section of superhighway will cost $8,700 per linear foot, or a total of some $50 million. The 6½-cubic yard trucks shown in this view are placing concrete on the "up" ramp of a tunnel that will be more than 90 feet wide.

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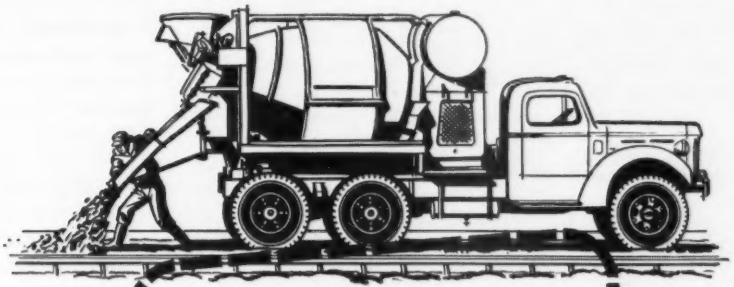

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questions and answers

QUESTION: What steps should be taken to assure good results when concrete surfaces are to be plastered?

ANSWER: If the intention to plaster is known in advance, the most important step is to provide some sort of mechanical key for bonding the plaster to the concrete. This is sometimes done by using forms with rough surfaces, or by means of inserts set in the forms to provide keys. Retarders are also used to some extent, and there are additionally several effective liquid bonding agents on the market. In the absence of a bonding agent the concrete surface should be brushed with water just before the plaster is applied. One-coat plastering is generally most successful. When two coats are applied the total thickness should not exceed ⅜ inch.

QUESTION: What firms in the United States now offer patented franchise systems of prestressing?

ANSWER: No list of this sort is ever complete, but the following concerns appear to be active in this field: Prestressing, Inc., Transit Tower, San Antonio, Texas; Stressteel Tensioning Units, Truscon Steel Division, Republic Steel Corporation, 1300 Albert Street, Youngstown 1, Ohio, (Lee-McCall System); Prescon, Inc., 16706 South Garfield Avenue, Paramount, California; Intercontinental Equipment Company, Inc., 120 Broadway, New York 5, New York, (Freyssinet System); The Preload Company, Inc., 211 East 37th Street, New York 16, New York; John A. Roebling's Sons Corporation, Trenton 2, New Jersey. Set-up service and engineering assistance are also provided on a fee basis by an organization known as Leap Concrete, P. O. Box 1053, Dept. L-15, Lakeland, Florida.

QUESTION: Is there any way to remove fire stains from concrete?

ANSWER: This can sometimes be accomplished by scouring the surface with powdered pumice, and then applying several layers of flannel saturated in a solution of trisodium phosphate and chlorinated lime. The fabric should be pressed firmly against the stained area, and it should be re-saturated periodically until the stain disappears. The solution may be prepared in the following manner: Dissolve 2 pounds of trisodium phosphate crystals in 1 gallon of water; then make a paste by mashing 12 ounces of powdered lime with a small quantity of water. Pour the paste and the trisodium phosphate solution into a 2-gallon stoneware jar, fill with water and stir thoroughly.

QUESTION: Is any data available on the effect of waterproof coatings on the durability of concrete?

ANSWER: W. G. Mitchell of the Corps of Engineers reported on this subject in the July 1957 issue of the *Journal* of the American Concrete Institute. His observations have lead him to believe that the exclusion of ingress water from concrete may make it permanently durable, and that the coatings used for this purpose will also increase resistance to deterioration caused by abrasion and cavitation. He does not believe that water can be kept out of concrete solely by the improvement of the concrete itself.

QUESTION: How much water must concrete contain in order to cure itself properly just by the prevention of evaporation?

ANSWER: If the water-cement ratio is more than 5 gallons per sack, there is probably enough free water to take care of curing if the water can be prevented from evaporating. It is generally believed that richer concretes should receive additional water during the early stages of curing.

QUESTION: Does a two-course sidewalk have any advantage over a one-course?

ANSWER: No, the one-course walk is believed to be considerably superior. It is stronger and there is no danger of separation between base and surface material. Two-course work was once popular because it made it possible to produce a finer-grained finish, but even this is now regarded as objectionable for reasons of safety.

Photo courtesy Concrete Facts

no place for watered concrete

Here's one job on which nobody seems to have suggested that it might be a good idea to hit the concrete with just a little more water. Even with very low-slump concrete it was something of a problem to place and finish a 4-inch thick slab on this 45-degree incline under an overpass in St. Louis. So slump was held as close to zero as possible, metal screeds were used, and the concrete was broomed for the finishing operation. The work was done by the F. G. Avey Company in connection with a new express highway.

QUESTION: Does vibration improve the strength of concrete pavements?

ANSWER: Yes, flexural and compressive strength may show an increase of as much as 10 percent according to test data compiled by the Bureau of Public Roads. Vibration shows the best results with mixtures having a slump of about 1 inch, and in which there is a somewhat higher than usual ratio of coarse to fine aggregate.

QUESTION: In sawing pavement joints, what is the best way to prevent the slab from cracking in front of the saw after the joint is partly sawed?

ANSWER: The best precaution is to do the sawing during the warmest part of the day, so that the concrete will be in compression rather than in tension.

QUESTION: What is high-test calcium chloride and how does it compare with ordinary calcium chloride?

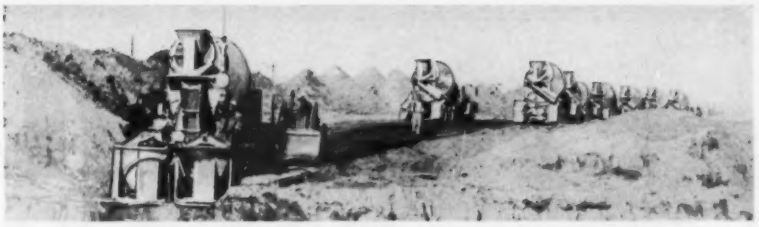
ANSWER: High-test calcium chloride contains from 94 to 98 percent CaCl, compared with 77 to 80 percent in the ordinary flake product. An 80-pound bag of high-test CaCl is equivalent to a 100-pound bag of standard flake.

QUESTION: Is there a formula for computing the amount of dynamite required to blast concrete walls?

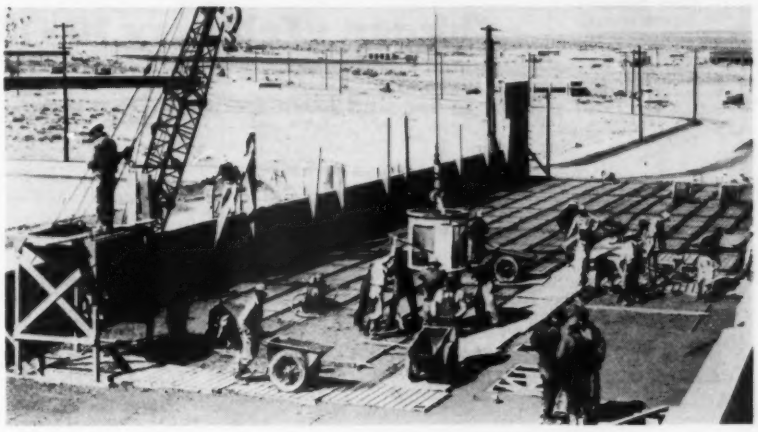
ANSWER: Studies at Stanford Research Institute, based on the use of the Army Corps of Engineers' standard demolition block of TNT, have come up with the following formula:

$$P = R^3KC$$

In this formula, P is the TNT required in pounds; R is the wall thickness in feet; K is a material factor which takes into account the thickness of the wall and whether the concrete is plain or reinforced; and C is a tamping factor which takes into account the additional power of TNT when it is backfilled. K for walls less than 3 feet thick is 0.95 for plain concrete, 1.66 for reinforced; for walls 3 to 5 feet thick, it is 0.72 plain, 1.28 reinforced; for 5 to 7 feet, it is 0.54 plain, 1.00 reinforced, and for over 7 feet, it is 0.56 plain and 0.89 reinforced. When there is backfill, C is 0.6; when there is no backfill, C=1.0.



Concrete job pays extra profits for careful planning of concrete handling



Concrete construction on this 300′ x 600′ airplane hangar required two types of concrete handling—(1) bulk handling for columns, foundation and 17″ thick walls and (2) slower paced handling for thin finished floor slabs. The problem was—how to prevent delays and inefficiencies in one or both placement jobs.

The answer here was to divide the work and use two separate crews and two concrete handling methods simultaneously.

First, two Gar-Bro Buckets per crane were used for the bulk placing. While one bucket was being filled, the other was placing concrete. Thus with a minimum crew, a fast pace was maintained.

Second, Gar-Bro Floor Hoppers and a fleet of Concrete Carts supplied the slab work. The concrete buckets load the floor hoppers for cart charging and alternate for direct column pouring, thus holding the balance of the operation.

In this way there were no delays and no interruptions of work. A steady delivery of concrete by ready mix trucks provided maximum efficiency.

Since every wasted minute costs money on a concrete job and delays cost more than equipment, it pays to plan each job properly. Many similar innovations are described in the regular issues of Gar-Bro Concrete News and the Gar-Bro Concrete Manual, available on request.

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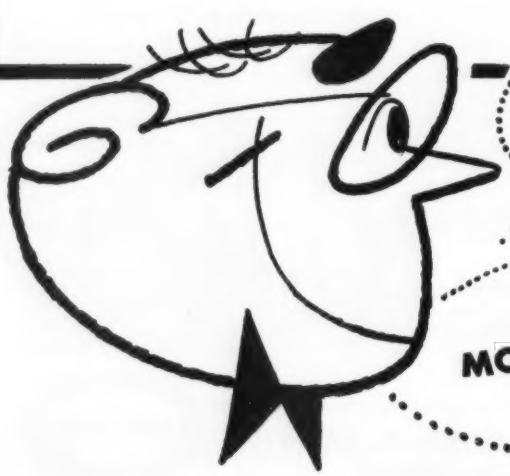

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Rockwell Spring & Axle Co.
Timken Detroit Axle Div.
Detroit, Mich.

Sarasota Engineering Co., Inc.
Sarasota, Fla.

Sauerman Bros., Inc.
Bellwood, Ill.

Screen Equipment Co., Inc.
Buffalo, N. Y.

Servicised Products Corp.
Chicago, Ill.

Sherman Products Inc.
Royal Oaks, Mich.

Sika Chemical Corp.
Passaic, N. J.

Simplicity Engineering Co.
Durand, Mich.

SKF Industries, Inc.
Philadelphia, Pa.

A. O. Smith Corp.
Permaglas Div.
Kankakee, Ill.

The T. L. Smith Co.
Milwaukee, Wis.

Smith Engineering Works
Milwaukee, Wis.

Soiltest, Inc.
Chicago, Ill.

The Solvay Process Div.
Allied Chemical & Dye Corp.
New York, N. Y.

Southwestern Engineering Co.
Los Angeles, Calif.

Stedman Foundry & Machine
Co., Inc.
Aurora, Ind.

Stephens-Adamson Mfg. Co.
Los Angeles, Calif.

Symons Clamp &
Manufacturing Co.
Chicago, Ill.

Syntron Company
Homer City, Pa.

Taylor-Wharton Iron &
Steel Co.
High Bridge, N. J.

The Thew Shovel Co.
Lorain, Ohio

Toledo Scale Co.
Toledo, Ohio

The Torrington Co.
South Bend, Ind.

Tractomotive Corp.
Deerfield, Ill.

The Transmission & Gear Co.
Dearborn, Mich.

The Travel Batcher Co.
Salt Lake City, Utah

The W. S. Tyler Co.
Cleveland, Ohio

Union Wire Rope Corp.
Kansas City, Mo.

The Universal Engineering
Corp.
Cedar Rapids, Iowa

Werco Steel Co.
Chicago, Ill.

Western Machinery Co.
San Francisco, Calif.

Westinghouse Transit
Mixer Div.
LeTourneau-Westinghouse
Co.
Indianapolis, Ind.

The White Motor Co.
Cleveland, Ohio

Whiteman Manufacturing Co.
Pacoima, Calif.

Willard Concrete Machinery
Co., Ltd.
Lynwood, Calif.

Charles E. Wood Co.
Milwaukee, Wis.

Gar Wood Industries, Inc.
Wayne, Mich.

Worthington Corp.
Plainfield Div.
Plainfield, N. J.

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equipment tools materials

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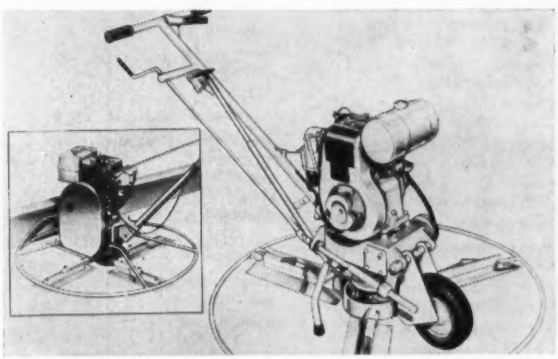
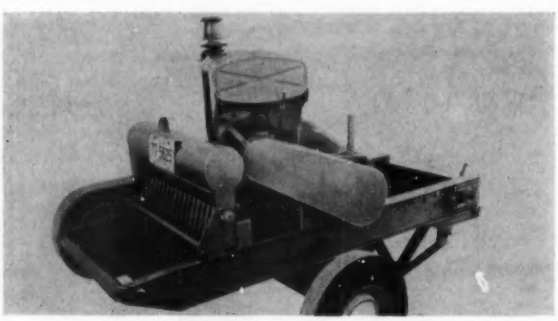
Prefab Forms At Work

A contractor who was given 320 days to pour 4,000 cubic yards of concrete for a bridge expects to complete the job in less than 220 days, or only ⅔ the time allotted to him in his contract. He credits the ease of erecting and stripping prefab forms with cutting down pouring time, reducing the number of men required on the job, and providing greater mobility for the pouring equipment. Only 3,144 square feet of panels were required for the 160,000 square feet of forming. **Symons Clamp & Manufacturing Company, 4249 Diversey Avenue, Chicago 39, Illinois.**

Enlarged Line of Power Trowels

A complete line of gasoline-powered, three- and four-blade trowelers ranging from 24 to 48 inches now provides a machine for every size job and every contractor. All models feature quick blade changing, and all but the two largest sizes (44 and 48 inches) can be converted into high-powered grinders by substituting accessory grind stones for troweling or floating blades. With the exception of the 28-inch three-blade model, all utilize separate float and troweling blades. All trowelers feature instant blade adjustment from the operating position. **Goldblatt Tool Company, 1910 Walnut Street, Kansas City 8, Missouri.**



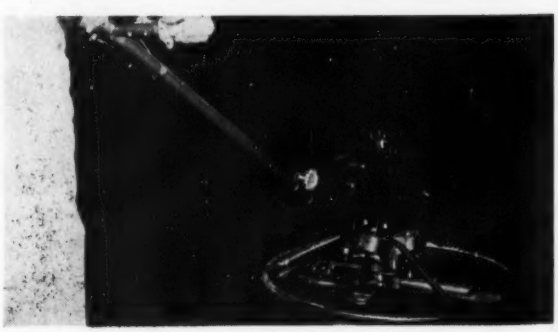


Form Cleaner

A portable, power-driven form cleaner reduces form-cleaning costs. Forms are loaded on a conveyor belt which pulls them under a rapidly rotating steel wire brush. They emerge from the far end of the conveyor belt cleaned, oiled and ready for reuse. The clutch operated machine is geared to clean forms at the rate of 42 lineal feet per minute. The cleaner can be moved with a car or truck, or by hand on the job. **Economy Forms Corporation, 4301 N. E. 14th Street, Des Moines, Iowa.**

4-Bladed Trowel

A new 34-inch troweling machine has 4 finish and 4 float blades. Both sets of blades are reversible for double life. The 4 blades are said to make this machine extremely easy to operate. It is equipped with a 2½ hp. engine and has a stationary guard ring, allowing the operator to work right up to walls and other obstructions. Another feature is the fool proof manual clutch control. **Stow Manufacturing Company, 354 Shear Street, Binghamton, New York.**



equipment and tools

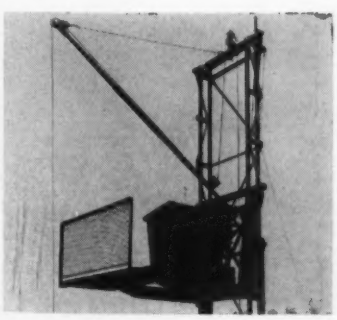
For additional free information mail cards facing page 16.

Power Trowel

A 29-inch power trowel weighing 77 pounds operates in all temperatures and gives good results even on low slump concrete. Designed to cover large areas and still go through doors and into corners, it features blades adjustable in operation and a control which idles the trowel if the operator lets go of the handle. **Master Vibrator Company, 1752 Stanley Avenue, Dayton 1, Ohio.**

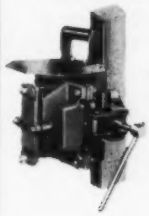
Platform-Boom Hoist

The platform and self-dumping bucket provide for hoisting materials between concrete loads without removing bucket. There is room for a wheelbarrow on the platform. The boom with a capacity of 1000 pounds hoists materials to the height at which the machine is working. It can be used with the platform and bucket installed. **Buck Equipment Corporation, 720-X Anderson Ferry Road, Cincinnati, Ohio.**



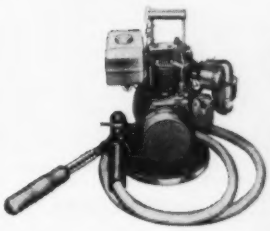
SYNTRON

CONCRETE VIBRATORS

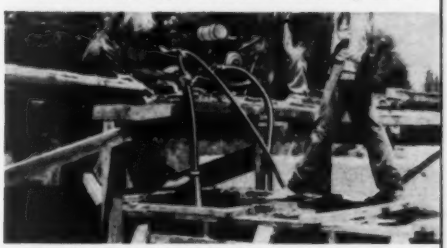


Electromagnetic Concrete Form Vibrators

V-55 Vibrator used to make a Vibrating screed



Electric or Gasoline Mass Concrete Vibrators



Gasoline Flexible Shaft Concrete Vibrator used in large footer form

for uniform compacting and settling concrete

SYNTRON Electromagnetic Concrete Vibrators provide a positive vibrating action that insures uniform compacting and settling of concrete. Easily attached to concrete pipe forms, block making machines, screeds, wall forms, etc. Available are sizes for every job. SYNTRON Mass Concrete Vibrators are ideal for settling concrete in narrow forms, footers, columns, foundations, etc. Flexible shaft with vibrating head is easily placed into forms. Available with 1½ or 2 hp. Electric Motor or 5 hp. Gasoline Motor. Flexible shafts available in lengths from 12 to 36 ft.

CC-158

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Vibrators (bins, hoppers, chutes)	Rectifiers (Silicon and Selenium)
Vibratory Feeders	a-c to d-c Selenium Rectifier Units
Vibratory Screens	Electric Heating Panels
Shaker Conveyors	Electric Heating Elements
Vibratory Elevator Feeders	Sinuated Wires
Weigh Feeders	Shaft Seals
Packers and Jolters	Electric Hammers
Hopper Feeders	Concrete Vibrators
Lapping Machines	Paper Joggers

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Berylex Cementing Compound protects concrete from damage caused by FREEZING. Just *ounces* of this revolutionary compound, added to *yards* of concrete mix, will give *real* and *practical* protection against the dangers of sudden freezing. Berylex is not an anti-freeze, but does give real protection to concrete during periods of warm days and very cold nights. The Berylex compound reactivates the cementing each time the temperature rises high enough to allow cementing action.

Besides preventing damage caused by freezing, Berylex DECREASES *shrinking and cracking, water-bleeding, flash setting, dusting, efflorescence . . .* and INCREASES *hardness, acid resistance, workability, fatness, water-resistance.*

Inclusion of Berylex Cementing Compound in any concrete will greatly increase its resistance to WINTER SALTING.

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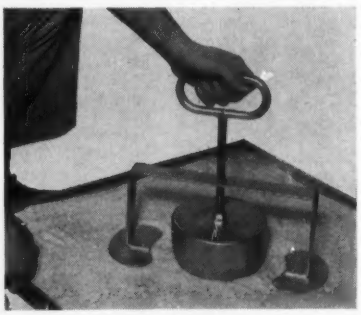
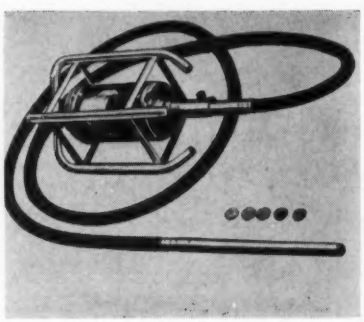


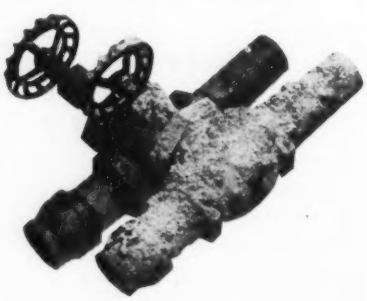
Penetration Tester

This 30-pound instrument consists of a cylinder with ball shaped bottom and handle. A lightweight metal frame guides the handle and serves as a reference for measuring depth of penetration of the ball. Fresh concrete is tested either in forms or container more simply than by the conventional slump test. **Soiltest, Inc., 4711 West North Avenue, Chicago 39, Illinois.**

Small Vibrator Head

A ¾-inch vibrator head weighing 20 pounds is especially adapted to the problem of placing low-slump concrete in narrow spaces. It is a high-kick, high-frequency unit for use in all restricted spaces where quality concrete is desired—such as for vibrating grout in masonry walls and for placing fireproofing. **Wyzenbeek & Staff, Inc., 223 North California Avenue, Chicago 12, Illinois.**



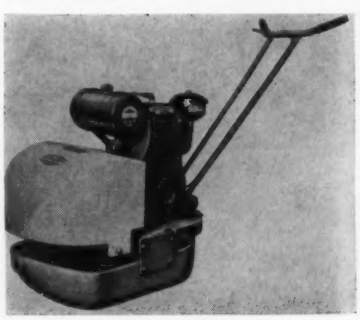


Concrete Dissolvent

A liquid dissolvent for hardened concrete comes in concentrated form and works on any mix of concrete, no matter how old, excepting concrete mixed with rubber. It has no effect on metals except aluminum, zinc or magnesium. It is useful for cleaning tools and equipment. Cleaning time varies from 4 hours to overnight. **Industrial Synthetics Corporation, 2000 West Walnut Street, Chicago, Illinois.**

Soil Compactor

This 950-pound hand-compactor delivers a 6600-pound impact, 2000 times per minute. Self-propelled speeds up to 75 feet per minute are possible under normal conditions. Designed to handle all types of fill, it maneuvers close to abutments, walls or piling. Tow bar and wheels are provided for towing. **Vibro-Plus Products, Inc., Stanhope, New Jersey.**



equipment tools materials

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Stain Finishes for Concrete

Pictured here are the materials required for imparting attractive finishes with stains. The stains alone are light and rustic colors resembling natural stone. For single color installations, a finish is usually applied over the stain for brighter and more uniform color. Stain plus wax is applied to smooth and nonporous concrete, while a stain and Col-r-tone combination is recommended on rough textured and porous surfaces. **Rohloff & Company, 918 North Western Avenue, Hollywood 29, California.**

Tractor-Compressor

According to the manufacturer, this heavy duty Pneumatractor is the equivalent of a sizeable fleet of construction equipment. It is a one-man operated, self-propelled tractor and air-compression plant combined. It breaks pavement, trenches, backfills, loads and supplies compressed air for tampers and form-pin drivers. Conversion from tractor to compressor is accomplished in an instant right from the instrument panel. **Schramm, Inc., 620 North Garfield Avenue, West Chester, Pennsylvania.**

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CONSISTENCY

CT-711 CONCRETE TESTER
CYLINDERS

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AGGREGATES

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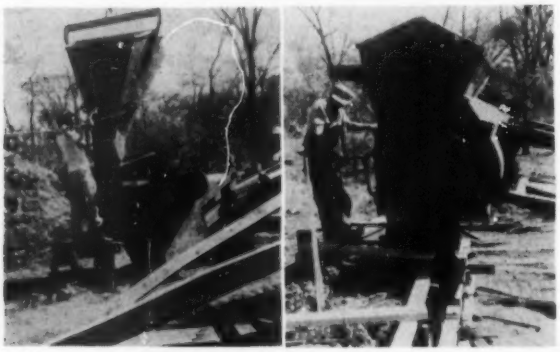


Flat Back Bucket

The flat-back bucket pictured here is at work with a front end loader—just one of many special uses for which the unit is adapted. Five standard models in the line have rated capacities of ⅜, ½, 1, 1½, and 2 cubic yards, while special models range from 3 cubic yards up. Among the noteworthy features is a pinpoint center dumping arrangement which lets all the concrete pour straight into forms. The flat-back design fits small forms next to walls. **Cimco Construction Industrial Manufacturing Company, Box 422, Marshalltown, Iowa.**

Straight-Edge

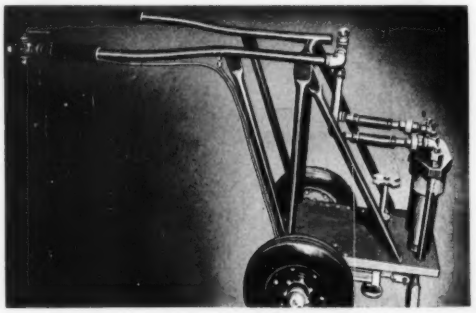
The Hi-Lo Detector consists of a 10-, 12-, or 16-foot aluminum I-beam; aluminum, rubber tired, ball bearing wheels; convertible rigid or steerable front wheel; 2-position handle, and upright support stand. It detects and marks areas not within specification limits on concrete slabs and forms. Wheel guides lower for operation on forms. The dye-marking attachment marks variations. A sounding device is available, with a bell for high spots and a buzzer for low spots. **Viking Manufacturing Company, Manhattan, Kansas.**

Muffle Cover

For John Mowlen and Company, Ltd., breaking up concrete at the end of Lambeth Bridge in London was becoming costly and time-consuming. Because the noise disturbed workers in the adjacent British Ministry of Works, the work was limited to morning and evening hours. With Thor muffle covers on paving breakers noise was reduced 60 percent and the contracting firm was allowed to resume full daily schedules. Muffle covers replace loud, metallic sounds with soft, thudding sounds. **Thor Power Tool Company, Prudential Plaza, Chicago 1, Illinois.**

Floor Surfacer

The Bicknell pneumatic floor surfacer is designed for such jobs as scuffing a smooth floor or walk to give a non-slip surface, for leveling uneven surfaces, roughing up old concrete preparatory to resurfacing, and making channels for conduit. It enables one man to do all these jobs quickly and effectively. The cutting rate is approximately ¼ inch on 70 square yards in 6 hours. **Bicknell Manufacturing Company, Rockland, Maine.**



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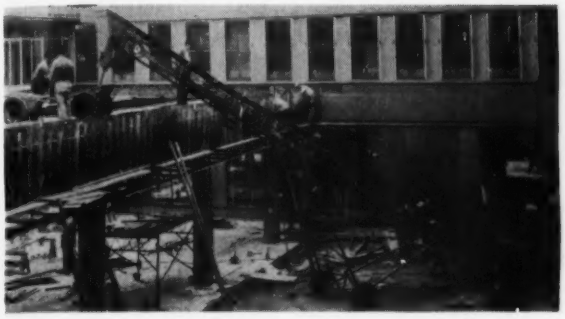
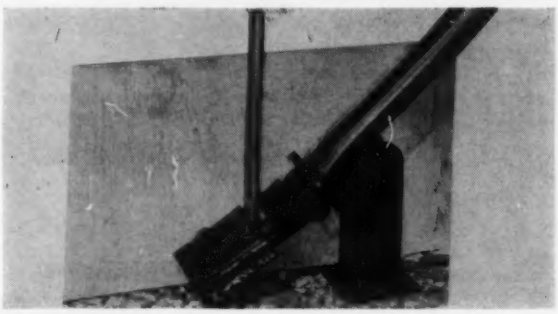


Conveyor

Swivel wheels make it possible to move this conveyor along the wall without changing its position in relation to forms. The unit is 40 feet long with a delivery height of 22 feet. Capacities depend upon slump, but average 20 to 40 cubic yards per hour. The deep hopper permits fast delivery from the transit mix truck. A self-cleaning foot pulley, belt wiper, swivel chute, side guide idlers and triple troughing idlers are other features. **The Fairfield Engineering Company, Marion, Ohio.**

Stake Puller

Designed to pull stakes quickly and easily without damage, this puller is adaptable to both wood and steel stakes. The adjustable plate on the jaw will accommodate every type of steel stake, angle, tee, channel, flat or round. It will pull steel pipe or rods ¼ inch to 2½ inches in diameter and can also be used as a rod puller to pull rods from concrete walls. **Universal Form Clamp Company, 1238 North Kostner Avenue, Chicago 51, Illinois.**



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- Will not twist or bend
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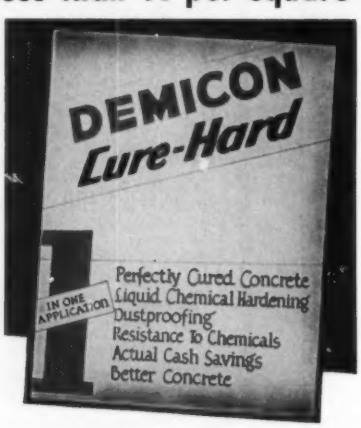

DEMICON CURE-HARD, when applied to freshly poured concrete, forms a perfect membrane for curing and water retention which is necessary to prevent cracking and hair checking. Since DEMICON CURE-HARD contains a powerful non-acid detergent penetrating agent the material is combined with the free lime and hydrated cement, producing a dust-free hardened surface.

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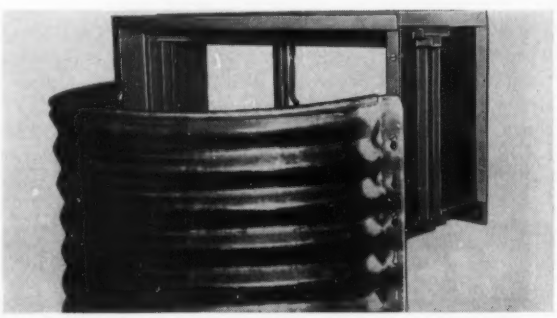
Basement Windows

This steel combination basement window with integral pouring form and window well is available in full wall thicknesses—8, 9 and 10 inches and other thicknesses on special order. The lightweight unit is easily installed by one man. No steel window bucks are required because this feature is built into the design, eliminating the need for stripping, cleaning and hauling steel or wood bucks. No stud guns, concrete nails or lag bolts are needed for installation. Windows are available in round and straight types, in various heights. **Kewanee Manufacturing Company, Kewanee, Illinois.**



Powered Wheelbarrow

The basic Merry Mover powered wheelbarrow comes equipped with a 25-inch long flat bed and is thus flexible enough to be used for hauling many construction materials. A 12-inch bed extension is also available. Utility and concrete trays, with capacities of three to five cubic feet, are optional. Either type may be added simply by securing a pin and setting a safety lock. Dumping can be accomplished with one hand. **Merry Manufacturing Company, Box 698, Edmonds, Washington.**

literature

Fill out and mail the postage-paid reader service cards facing page 16 to obtain your personal FREE copies of any of the publications described in this department.

Study on portland cement. "Dateline: 2000 A. D." is the title of a discussion of a study being made on the performance of portland cement used in the making of concrete. This long-time study is being conducted in an effort to find out more about many of the factors that influence the durability of concrete structures, with the idea of insuring maximum service from all concrete construction at minimum cost. Available from Portland Cement Association, 33 West Grand Avenue, Chicago 10, Illinois.

Flashers, lanterns, torches. A complete line of warning and portable lights is described in catalog No. 54. Construction, operation and maintenance details are given, all well illustrated. A section is devoted to barricades and warning devices for highway construction work as recommended by the National Safety Council. Available from R. E. Dietz Company, Syracuse, New York.

Cement enamel. A vitreous surface cold-glazed finish is described in a catalog. Cost and space saving advantages, application techniques and architect's specifications are included. Cement Enamel gives glass-hard surfacing on new or existing walls, interior or exterior, bare or painted, concrete, masonry units, stucco, plaster or hardboard. Cement Enamel Sales Corporation of the Americas, 787 United Nations Plaza, New York 17, N. Y.

Floor Hardener. A bulletin describes Hydroment, a balanced concrete floor hardener which assures a dust free, acid resistant surface which will not rust and which is extremely durable since it is much harder than concrete. The manufacturer will assist and advise the floor contractor on its best utilization and method of application. The Upco Company, 4805 Lexington Avenue, Cleveland 3, Ohio.

Form coating. A folder presents questions and answers concerning Formguard, a form coating which is water-thin, dries immediately, completely waterproofs forms (wood, metal or plastic), is economical and transfers no oil to the concrete face when stripped. The material is to be diluted one part Formguard to four parts fuel oil. It is applied by hand or power-spray. Forms may be re-used many times without recoating. Industrial Synthetics Corporation, 2000 West Walnut Street, Chicago 12, Illinois.

Crawler fork-lift. This booklet contains reports reprinted from recent issues of leading trade publications concerning the use of the Terratrac Fork-Lift on various building projects. The equipment speeds material handling and can be operated in adverse weather and ground conditions where wheeled vehicles are useless. Well illustrated with on-the-job pictures, the booklet is available from J. I. Case Company, Racine, Wisconsin.

Soil compactor. A 12-page booklet entitled "Soil Compaction by Vibroflotation" tells of a method to compact loose granular soil to any required depth to 100 feet or more without need of piling or forms for footing. How it is used and what results can be obtained are described in proven applications for dams, bridges and all types of building formation. Vibroflotation Foundation Company, 930 Fort Duquesne Boulevard, Pittsburgh 22, Pennsylvania.

Lightweight concrete information sheet. Information sheet No. 5 deals with design coefficients based on the A. C. I. Building Code's working stress for concrete. A table of design coefficients is presented to aid the structural engineer in economically designing expanded shale lightweight concrete structures. A second table gives hypothetical examples of some approaches to economy through the use of lightweight expanded shale, clay and slate structural concrete. Expanded Shale Clay and Slate Institute, 658 Warner Building, Washington 4.

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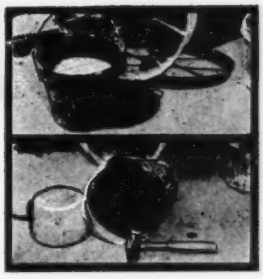

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FREE copies of these items may be obtained by mailing the reader cards facing page 16.

Vermiculite concrete as a horizontal diaphragm. A summary report covering a test program on vermiculite concrete roof decks indicates that such decks have a high safety factor in resisting earthquake loads. The report is of special interest in areas subject to seismic disturbances where ability of roof deck material to resist lateral forces and to function as a horizontal diaphragm is important. Vermiculite Institute, 208 South La Salle Street, Chicago 4, Illinois.

Expansion anchors and pin bolt drives. A 6-page catalog includes four types of self drilling expansion anchors for concrete for installation with electric or air hammer and a fifth type to be installed by hand hammer. Pin bolt drives for powerful grip in concrete and other materials are also described. Full specifications accompany photographs of all equipment. J. D. Polis Manufacturing Company, 2900 West 26th Street, Dept. A168, Chicago 23, Illinois.

Truck mixer standards. Information on the ratings recently established as standard for truck mixers and agitators is available in a booklet. Approved by the Board of Directors of the National Ready Mixed Concrete Association, the revised standards became effective May 1, 1957. The bulletin covers the new requirements for all phases of mixing. Truck Mixer Manufacturers Bureau, Munsey Building, Washington 4, D. C.

Steel forms. Permanent, portable, interchangeable steel forms for precast prestressed concrete production are pictured and described in a 16-page brochure. The use of liners, inserts and filler channels permits production of sections in a wide range of sizes from one form. Precise fabrication and pre-alignment assure perfect fit of each section in installation. Plant City Welding and Tank Company, Concrete Form Division, P. O. Box 1308, Plant City, Florida.

Bridge deck survey. This newly revised brochure covers a survey of about 70 bridges in the United States and Canada built from 1922 to 1956. Data is given on the type of mix used, the surfacing material, the quantity of traffic using the bridge, and the present condition of the bridge. Expanded Shale Clay and Slate Institute, 658 Warner Building, Washington 4, D. C.

Steel stakes. A bulletin pictures a high carbon alloy steel stake which will last indefinitely. It drives easily into hard earth and sub-grades without bending or splitting. Flat surfaces of the stake and nail holes spaced exactly 1 inch apart make it easy to nail firmly and securely with no possibility of rolling. By using the pullout hole at the top it is easy to remove without special tools. Various sizes, with prices, are given. Symons Clamp and Manufacturing Company, 4271 Diversey Avenue, Chicago 39, Illinois.

Portable heating equipment. Catalog No. 259 covers a line of Insto-Hot blower type heaters, salamanders, infrared heaters, equipment and accessories for operation with LP gas. Complete information on all these portable heaters accompanies illustrations. Insto-Gas Corporation, Detroit 7, Michigan.

Grinding heads. Grinding head attachments No. 620 and No. 824 for Kelley Compactor Power Float are pictured in a bulletin. These are recommended for general purpose concrete floor grinding such as removing surface imperfections and trowel marks, blending in patches and joints, and cutting down high spots. Kelley Machine Division, Wiesner-Rapp Company, Inc., 285 Hinman Avenue, Buffalo 23, New York.

Forming equipment. A 28-page catalog of wood-ply forms, steel-ply forms, mag-ply forms, hardware, form ties and accessories, brackets, shoring equipment and column clamps with pictures and descriptions of the items and construction projects of the equipment in use is available. The firm's free engineering and field service is described. Catalog No. F-12, Symons Clamp and Manufacturing Company, 4271 Diversey Avenue, Chicago 39, Illinois.

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Form coating. Form-Saver, a quick-drying protective coating with durable, smooth finish for plywood form panels, extends the life of forms and makes possible many re-uses before re-coating is necessary. A brochure tells how the product fulfills working requirements and indicates how it may be used to speed tilt-up construction. Instructions for application by either brush or dip are outlined. Sketches illustrate step-by-step treatment of plywood with the product. Building Products Division, L. Sonneborn Sons, Inc., 404 Fourth Avenue, New York City.

Pocket Penetrometer. A leaflet describes the Soiltest Pocket Penetrometer for evaluating the shearing strength of soil on field exploration or construction sites and in preliminary laboratory studies. Also included are descriptions of the Hi-Lo Detector for checking surfaces of concrete and bituminous pavement slabs accurately and rapidly, the Kelly Ball for testing concrete either in forms or in containers, and the Air Indicator for determining air content of fresh concrete. Soiltest, Inc., 4711 West North Avenue, Chicago 39, Illinois.

Shaker Sieves. Several sieves and accessories are pictured in a folder, and descriptions and prices are provided The Dynamic Sieve Shaker is used for all types of field, laboratory and production sieving or gradation operations, for soils, sand, gravel, aggregates, construction materials, powders, plastics, powdered metals and all types of granular and powdery materials. Soiltest, Inc., 4711 West North Avenue, Chicago 39, Illinois.

Grout ad-mix. Tile-Weld is a bonding agent, which when added with water to Portland cement, changes the chemical nature of the grout, rendering it more flexible and increasing its strength. Inherent bonding properties provide better adhesion to the sides of the tile. Self-curing produces a dustless finish which is hard and minimizes shrinking and cracking. Tile-Weld is used full strength to bond a mortar bed for tile to structurally sound surfaces without suction, eliminating the need for metal lath. It contains nothing that might discolor pure white grout. Described in Bulletin No. 69, available from Larsen Products Corporation, 4933 Elm Street, Bethesda 14, Maryland.

Power buggy. Model 15A Prime-Mover is engineered to be used throughout all kinds of construction jobs. Compact dimensions allow the Prime-Mover to operate on the same type of runways, ramps, hoists and towers that are used for hand carts. Dump bucket and flatbed are quickly interchangeable with no tools required and one man can haul three-fourths ton of all types of materials over rough terrain and up 20 per-cent grades. Dimensions, mechanical data and illustrations are included in form PM 15C-1 available from The Prime-Mover Company, Muscatine, Iowa.

Electric drills. A new folder, JE-2263, features the Thor "EN" series of ⅜, ¾, ⅞, and 1-inch reversible portable electric drills. These are heavy duty drills. Also included are specifications of Thor's "EL" and "EJ" electric drill series, screwdriver-nutsetters, and impact wrenches. Thor Power Tool Company, Prudential Plaza, Chicago 1.

Compression testing equipment. A catalog folder containing pictures and descriptions of various models of compression and flexure testing machines for testing cylinders, cubes, concrete blocks, beams and lintels and brick, concrete compression testers of varying capacities, a high and low pressure compression tester for concrete, clay, and tile pipe and Forney Permanent Cylinder Molds may be obtained from Forney's Incorporated, Tester Division, P. O. Box 310, New Castle, Pennsylvania.

Construction equipment. Bulletin CG-15 describes Le Roi's complete line of portable air compressors, both reciprocating and rotary; the Tractair, a combination compressor-tractor, and attachments; Le Roi Newmatic air tools, including breakers, drills, tampers, and spades; and CRD one-use drill bits. Photographs, many of construction scenes, illustrate the products. Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Company, Milwaukee.

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Typical Weld-Crete Application: One of several Southern California High Schools where Weld-Crete was sprayed on new, smooth tilt-up wall to provide bond for sprayed on stucco application. *Arch.*, H. L. Gogerty; *Gen'l. Contr.*, J. C. Boespflug Contr. Co.; *Plastg. Contr.*, A. D. Hoppe Co. *Applicator:* F. K. Pullen Co.

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Liquid admixture. Information on Trimix, a multipurpose integral liquid admixture which allows concrete and masonry work to continue through frost and freezing temperatures down to 15° F., is presented in a folder. The product is said to facilitate the effective laying, pouring, placing and handling of cement mixes during subfreezing weather, to improve the workability of concrete, mortar, and stucco mixes and to accelerate set, producing high early compression strength and improving quality of finished concrete. L. Sonneborn Sons, Inc., Building Products Division, 404 Fourth Avenue, New York 16, N. Y.

Steel stakes. A folder describes Dee solid steel stakes and accessories and illustrates their use on construction sites. Stakes are available in standard or heavy duty weights in stock lengths 18, 24, 30, and 36 inches with twelve pre-located nail holes on 1 inch centers. Dee Concrete Products Company, 670 North Michigan Avenue, Chicago 11, Illinois.

Concrete floor finishers. The Kelley Hydra-Trowel, Bantam Trowel, Boy Trowel and Compactor Power Float are pictured in a folder, 25M-1256, and uses and advantages of each are pointed out. Valuable concrete floor finishing tips are included. Kelley Machine Division, Wiesner-Rapp Company, Inc., 285 Hinman Avenue, Buffalo 23, New York.

Rust prevention. The Sonneborn Rust Prevention System is outlined in a 4-page brochure. Information on where, when, and how to use SRP 75 Primer for priming rusted surfaces and SRP 87 Finish Coat, which adheres to and coats metal surfaces with a protective finish is included. Specifications, technical packaging and shipping data on the products are included. These coatings are said to provide greater durability and elasticity in contact with the corrosive elements, and results of field performance tests are pointed out. L. Sonneborn Sons, Inc., Building Products Division, 404 Fourth Avenue, New York 16, N. Y.

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